

## **Multi-fluid in carbonate reservoir: Geochemistry evidence from cement of Ordovician in Erdos Basin, northwest China**

Z. L. HE, J. T. ZHANG, Q. DING, Y. P. SUN AND X. H. JIN

SINOPEC Petroleum Exploration & Production Research  
Institute, zhangjt.syky@sinopec.com

The multi- fluid have an important effect on the formation and evolution of the carbonate reservoir. Cement, as the product of fluid flow, is a recorder of the type, active process and mechanism of the movements as well. In this study, we investigate the mineralogy and geochemistry of cement in different geological periods of Ordovician in Erdos basin, Northwest China, so as to reveal the formation of the carbonate reservoir.

Dolomite containing anhydrite is the major reservoir rock. The cement of the rock mainly comprised of calcite, silt crystalline dolomite, and coarse crystalline dolomite, with a small amount of quartz, kaolinite, pyrite, etc. The composition of those cement indicated a multi-periods fluid flow and various controlling mechanisms. It's a significant difference in mineralogical and geochemical characteristics among various cement. The coarse crystalline type of the calcite fully filled the pore. The calcite showed orange color under cathodoluminescence, and the medium Mn content (108~302ppm), relatively low Fe content (661~1851ppm) and the lowest  $\delta_{18}\text{O}\text{‰}$  (PDB) (-9.4‰~-16.4‰) of the calcite indicated an atmospheric origin. Silt crystalline dolomite showed a light orange color under cathodoluminescence, or a dark red color relative to matrix dolomite with two parts: the core and the cortex. The overall Fe content and Mn content (886~2107ppm and 30~185ppm, respectively) were close to matrix dolomite as well. Furthermore, the  $\delta_{18}\text{O}\text{‰}$ (PDB) (-9.8~-11‰) and  $\delta_{13}\text{C}\text{‰}$ (PDB) (-0.7~-2.3‰) was partial negative compared to that of the matrix dolomite (1.4~-2.5‰), and showed a dual effect from both atmospheric and hydrothermal fluid flow. Coarse crystalline saddle dolomite have a higher Mn and Fe content (29112~47147pp , 364~565ppm, respectively), less negative  $\delta_{18}\text{O}\text{‰}$  (PDB) (-9.9~-11.3‰) and  $\delta_{13}\text{C}\text{‰}$  (PDB) (-1.7~-2.9‰), indicated characteristics hydrothermal fluid.

In regional scale, calcite are mainly distributed eastern of Erdos basin, showed a low topography in ancient karst period. In the western basin, silt crystalline dolomite was the major cement type and showed the influence from ancient sedimentary environments.

*This work was supported the National Basic Research Program of China (Grant No. 2012CB214802)*